Extravehicular Activity (EVA) Technology Development Status and Forecast

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Beginning in Fiscal Year (FY) 2011, Extravehicular activity (EVA) technology development became a technology foundational domain under a new program Enabling Technology Development and Demonstration. The goal of the EVA technology effort is to further develop technologies that will be used to demonstrate a robust EVA system that has application for a variety of future missions including microgravity and surface EVA. Overall the objectives will be reduce system mass, reduce consumables and maintenance, increase EVA hardware robustness and life, increase crew member efficiency and autonomy, and enable rapid vehicle egress and ingress. Over the past several years, NASA realized a tremendous increase in EVA system development as part of the Exploration Technology Development Program and the Constellation Program. The evident demand for efficient and reliable EVA technologies, particularly regenerable technologies was apparent under these former programs and will continue to be needed as future mission opportunities arise. The technological need for EVA in space has been realized over the last several decades by the Gemini, Apollo, Skylab, Space Shuttle, and the International Space Station (ISS) programs. EVAs were critical to the success of these programs. Now with the ISS extension to 2028 in conjunction with a current forecasted need of at least eight EVAs per year, the EVA technology life and limited availability of the EMUs will become a critical issue eventually. The current Extravehicular Mobility Unit (EMU) has vastly served EVA demands by performing critical operations to assemble the ISS and provide repairs of satellites such as the Hubble Space Telescope. However, as the life of ISS and the vision for future mission opportunities are realized, a new EVA systems capability could be an option for the future mission applications building off of the technology development over the last several years. Besides ISS, potential mission applications include EVAs for missions to Near Earth Objects (NEO), Phobos, or future surface missions. Surface missions could include either exploration of the Moon or Mars. Providing an EVA capability for these types of missions enables in-space construction of complex vehicles or satellites, hands on exploration of new parts of our solar system, and engages the public through the inspiration of knowing that humans are exploring places that they have never been before. This paper offers insight into what is currently being developed and what the potential opportunities are in the forecast.

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